WHAT IS CLAIMED IS:

Sub B1 C1

1. A method for growing single crystals of perovskite oxides, which show abnormal grain growths by means of heating, the method comprising the steps of:

(a) having a perovskite seed single crystal adjoined to a perovskite polycrystal; and

(b) heating the combination of the seed single crystal and the polycrystal to provide a continuous growth of the same structure as the seed single crystal in the polycrystal, the heating being carried out under the condition that abnormal grain growths are induced at the interface between the polycrystal and the seed single crystal and are repressed inside the polycrystal.

2. The method as claimed in Claim 1, wherein the heating of said step (b) is carried out under the condition that the ratio of the components of the perovskite polycrystal is controlled.

3. The method as claimed in Claim 1, wherein the heating of said step (b) is carried out under the condition that specific components of the perovskite polycrystal are added in excess of the original composition.

4. The method as claimed in Claim 1, wherein the heating of said step (b) is carried out under the condition that a temperature gradient is formed such that the temperature of the single crystal side is high and the temperature of the polycrystal side is low.

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5. The method as claimed in Claim 1, wherein the heating of said step (b) is carried

out under the condition that additives for promoting abnormal grain growths are locally added to the combination of the seed single crystal and the polycrystal.

6. The method as claimed in Claims ~~2~~ 5 or ~~3~~ 6, wherein the polycrystal is a Pb-type perovskite polycrystal in which abnormal grain growths occur by a change of the ratio of the components or an excess addition of specific components.

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7. The method as claimed in any one of Claims ~~1 to 5~~ 1, 2, 3, 5, or 6, wherein the step (a) includes placing the seed single crystal on the polycrystal or a powder molded body of perovskite oxides; or embedding the seed single crystal in the powder, and then performing a molding process; or adjoining the polycrystal to the seed single crystal, and then embedding the combination of the polycrystal and the seed single crystal in the powder and then performing a molding process.

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8. The method as claimed in any one of Claims ~~1 to 5~~ 1, 2, 3, 5, or 6, wherein the seed single crystal of the step (a) is the perovskite single crystal produced by the said methods.

9. The method as claimed in Claim ~~6~~ 7, wherein the seed single crystal is a single crystal of barium titanate or perovskite having the same crystal structure as barium titanate.

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10. The method as claimed in any one of Claims ~~1 to 5~~ 1, 2, 3, 5, or 6, further comprising the step of:

prior to the step (a), predetermining the crystal orientation of the seed single crystal, grinding a specific crystal face of the seed single crystal in the crystal orientation determined, and adjoining the ground seed single crystal to the polycrystal to determine

the crystal orientation of a single crystal to be grown into the polycrystal from the seed single crystal.

17. ~~11.~~ The method as claimed in any one of Claim ~~1 to 5~~ 1,2,3,5, or 6 further comprising the step of: prior to the step (a), molding the polycrystal powder to a desired shape or processing the polycrystal into a complex shape, and then adjoining the shaped polycrystal to the seed single crystal, to produce a single crystal having a desired shape without a separate step for processing of the single crystal.

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18. ~~12.~~ The method as claimed in any one of Claim ~~1 to 5~~ 1,2,3,5, or 6 further comprising the step of: prior to the step (a), preparing a polycrystal having a different porosity, pore size and pore shape by adding an additive to the polycrystal, changing the amount of a liquid phase or the sintering temperature, atmosphere or pressure of the polycrystal, to control the porosity, the pore size and shape in the single crystal to be grown in the polycrystal, thereby preparing perfectly dense single crystals destitute of pores or single crystals having various porosities.

19. ~~13.~~ The method as claimed in any one of Claim ~~1 to 5~~ 1,2,3,5 or 6, the perovskite polycrystal of the step (a) is the polycrystal having a composition gradient that changes discontinuously or continuously by adding one or more selected from the group consisting of solutes to be solved into perovskite structures to the perovskite polycrystal.

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20. ~~14.~~ The method as claimed in any one of Claim ~~1 to 5~~ 1,2,3,5, or 6, wherein the seed single crystal of the step (a) is a single crystal of barium titanate including a (111) double twin to provide the polycrystal adjoined to the (111) double twin plate.

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15. The method as claimed in any one of Claim ~~1 to 5~~ 1, 2, 3, 5, or 6 the heating temperature of the step(b) is slightly lower than the secondary abnormal grain growth activating temperature of the combination of the seed single crystal and the polycrystal.

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16. The method as claimed in any one of Claims ~~1 to 5~~ 1, 2, 3, 5, or 6 the perovskite polycrystal is characterized in that one or more additives selected from the group consisting of BaO, Bi_2O_3, CaO, CdO, CeO_2, CoO, Cr_2O_3, Fe_2O_3, HfO_2, K_2O, La_2O_3, MgO, MnO_2, Na_2O, Nb_2O_5, Nd_2O_3, NiO, PbO, Sc_2O_3, SmO_2, SnO_2, SrO, Ta_2O_5, TiO_2, UO_2, Y_2O_3, ZnO, and ZrO_2 to be solid-solved into perovskite structures are added to the polycrystal.

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23.

17. The method as claimed in any one of Claim ~~1 to 5~~ 1, 2, 3, 5, or 6 the seed single crystal of the step (a) has a plate-shape or "¬"-shape.

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18. The method as claimed in Claim ~~5~~ 3 the additives are one or more selected from the group consisting of Al_2O_3, B_2O_3, CuO, GeO_2, Li_2O_3, P_2O_5, PbO, SiO_2 and V_2O_5.

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19. The method as claimed in Claim ~~6~~ 7 the Pb-type perovskite polycrystal is (1-x)[Pb($Mg_{1/3}Nb_{2/3}$)O_3]-x[$PbTiO_3$] ($0 \leq x \leq 1$) (PMN-PT) polycrystal.

10.

20. The method as claimed in Claim ~~19~~ 9 the heating is carried out under the condition that at least one of PbO and MgO, which are components of the polycrystal, are added in excess of the composition formula.

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21. The method as claimed in Claim ~~6~~ 7 the Pb-type perovskite polycrystal is

$Pb(Zr_xTi_{1-x})O_3$ ($0 \le x \le 1$) (PZT) polycrystal.

12.

22. The method as claimed in Claim ~~21~~ 11, the heating is carried out under the condition that PbO of a component of the polycrystal is added in excess of the composition formula.

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13.

23. The method as claimed in Claim ~~21~~ 11, the heating is carried out by using $Pb(Zr_xTi_{1-x})O_3$ powder particles having nano sizes.